

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Fluid Flow Control Valves

We, UNITED KINGDOM ATOMIC ENERGY AUTHORITY, London, a British Authority, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to fluid flow control valves and it provides a fluid flow control valve in combination with a fluidised bed reactor.

The fluidised bed reactor used for making a main product in the form of a fine powder it is desirable to ensure that the powder is not carried away by the fluidising gas as it leaves the reactor. The gas may be filtered as it leaves the reactor but a problem arises in that the filter may become clogged by the powder. To overcome this and to enable the reactor to be operated continuously, a set of filters may be used, each of which in turn is periodically isolated and cleaned.

According to the invention there is provided a fluid flow control valve in combination with a fluidised bed reactor, the valve comprising a valve body having an inlet and an outlet and a number of ports, the reactor comprising a set of filters each having its outlet connected to one of the ports, the body housing a valve plug rotatable to isolate each of the ports in turn and to couple the other ports together, and the plug defining passageways for connecting the isolated port to the inlet and the coupled ports to the outlet.

By way of example, the invention will now be described with reference to the drawings accompanying the provisional specification in which:—

Figure 1 is a sectional elevation,

Figure 2 is a section on the line II—II of Figure 1,

Figure 3 is a plan view of a part of Figure 1, and

Figure 4 is a flow diagram.

Referring to Figs. 1 to 3, a fluid flow control valve 1 comprises a valve body 2 having seven equi-spaced ports 3 and housing a valve plug 4 having a part-circumferential groove 5, the plug 4 being rotatable to isolate each of the ports 3 in turn and to couple the other ports 3 together. The plug 4 has an upper circumferential groove 6 and the body 2 has an inlet 7 communicating with the groove 6. The plug 4 has a longitudinal groove 8 communicating at its upper end with the groove 6 and at its lower end with a cavity 9 in the plug 4. The groove 5 extends in length so as to couple six of the ports 3 together and the cavity 9 is positioned between the ends of the groove 5 so as to register with the seventh port 3. The lower end of the plug 4 is reduced in radius to define with the body 2 a circumferential passageway 10. The plug 4 has a longitudinal groove 11 communicating at its upper end with the groove 5 and at its lower end with the passageway 10. The body 2 has an outlet 12 communicating with the passageway 10. The ports 3 each have a connecting pipe 13 and the inlet 7 and outlet 12 have connecting pipes 14, 15 respectively.

The body 2 has bonded to it an inner lining 16 through which the ports 3, inlet 7, and outlet 12 extend and a top plate 17 clamped to a flange 18 on the body 2 by bolts 19, a sealing ring 20 being provided. The plug 4 has an integral shaft 21 sealed in passage through the plate 17 by alternate metal washers 22 and washers 23 held in position by a flanged ring plate 24 clamped to the plate 17 by studs and nuts 25. A star wheel 26 (shown in plan view in Fig. 3) is secured to the shaft 21 by a pin 27. The wheel 26

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has seven equi-spaced radial slots 28. A ring plate 29 is supported and spaced from the body 2 by three studs 30 spaced round and screwed into the plate 17 and each having a central portion 31 of hexagonal section on which the plate 29 rests. A ring plate 32 similar to the plate 29 is supported and spaced from the plate 29 by tubes 33 through which the studs 30 pass, the plates 29, 32 being clamped by nuts 34 on the studs 30. The plates 29, 32 locate a driving wheel 35 having a motor driven shaft 36 mounted in bearings 37, 38. The wheel 35 has two lugs 39 carrying a circular section striker pin 40 extending between them.

Fig. 4 shows in diagrammatic form the valve 1 in use with a fluidised bed reactor 41 used for making a main product in the form of a fine powder and having a set of seven filters 42 filtering the fluidised gas as it leaves the reactor 41. Each filter 42 has its gas outlet 43 connected to one of the ports 3 by one of the pipes 13, the pipe 14 is used as a compressed air inlet and the pipe 15 is used as a main gas outlet pipe to a chimney 44.

In use, flow of fluidising gas through the reactor 41 is as shown by arrow 45. On rotation of the wheel 39 via the shaft 36, the striker pin 40 engages one of the slots 28 and rotates the wheel 26 by one seventh of a revolution when the pin 40 disengages the slot 28 and the wheel 26 is stationary until the wheel 39 has rotated to bring the pin 40 into engagement with the next slot 28. Each one seventh of a revolution of the wheel 26 rotates the shaft 21 and the plug 4 by one seventh of a revolution thereby isolating one of the ports 3 and thus its associated filter 42 and bringing the cavity 9 into register with the isolated port 3. During the time the plug 4 is stationary the isolated filter 42 is purged

with compressed air from the pipe 14 flowing through the inlet 7, the groove 6, the groove 8, cavity 9, the isolated port 3 and its pipe 13, thereby clearing the filter 42 of any powder collected therein. (To emphasize the function of the valve 1, the path of the compressed air through the valve 1 is shown diagrammatically in Fig. 4 in dotted outline as path 46). During this period the other six ports 3 are connected by the groove 5 and the gas feeding to these ports 3 from their pipes 13 exhausts from the valve 1 via the groove 5, the groove 11, the passageway 10, the outlet 12 and the pipe 15 to the chimney 44. On the next part revolution of the plug 4, the next of the ports 3 is isolated and its associated filter 42 is purged by the above described process. Thus each filter 42 in turn is periodically isolated and cleaned.

WHAT WE CLAIM IS:—

1. A fluid flow control valve in combination with a fluidised bed reactor, the valve comprising a valve body having an inlet and an outlet and a number of ports, the reactor comprising a set of filters each having its outlet connected to one of the ports, the body housing a valve plug rotatable to isolate each of the ports in turn and to couple the other ports together, and the plug defining passageways for connecting the isolated port to the inlet and the coupled ports to the outlet.

2. A fluid flow control valve in combination with a fluidised bed reactor, substantially as hereinbefore described with reference to and as illustrated in the drawings accompanying the provisional specification.

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FIG. I.





